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Participatory Ergonomics and Workers' Commitment in Selected Secondary Healthcare Institutions in Akwa Ibom State

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Abstract:

This study was conducted to examine the nexus between participatory ergonomics and worker's commitment in selected secondary healthcare institutions of Akwa Ibom State, Nigeria. The survey research design was adopted for the study, while a sample size of 456 were drawn from a population size of 2760 using Krejcie and Morgan's formula. A structured questionnaire was developed for the study and administered to 456 sampled respondents. Hypotheses of the study were tested using structural equation modelling technique (SEM). Results of the analyses revealed that there is a positive, weak, but significant relationship between participatory communication and feedback and healthcare workers competitiveness: PC&F (β: 0.098, t-value: 2.206, p-value: 0.014). In addition, results indicate that a strong, positive, and significant relationship exist between participatory job design (PJD) and employee competitiveness: PJB (β: 0.799 and t-value: 20.831, p-value: 0.000). Based on these findings, it was concluded that Engaging workers in designing their tasks ensures that they are not only comfortable but also more focused and effective in their roles and also, prioritizing participatory job design initiatives such as collaborative task allocation, design of workstations, flexible work plan and schedule, and team- based care planning. It was recommended that employees should be involved in designing tasks with a clear understanding of how those tasks impact operational efficiency, patient care quality, and personal productivity. It is also possible to build a continuous feedback loop between employees and management to ensure that job design is regularly updated to meet evolving needs.

Keyword: Participatory Ergonomics, Workers' Commitment, Participatory Communication and Feedback, Participatory Job Design

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1. Introduction

The increasing competition in today's business environment and the demand for higher level productivity have driven organizations to adopt cutting-edge workplace strategies that prioritize both performance and employee well-being. One approach that is presently gaining attention is the management of workplace ergonomics. Workplace or Human Factor Ergonomics (HFE) is concerned with designing and arranging workstations, equipment, and task processes to fit the physical and cognitive needs of employees. The goal of ergonomics is to increase efficiency while minimizing hazards. The International Ergonomics Association (IEA, 2000), defines ergonomics as the scientific study of human interactions with other elements of a system and the discipline that applies theories, methods, and principles to optimize human well-being and system performance. Ergonomics aims to modify the workplace to fit the worker, reducing discomfort, and minimizing the risk of injuries related to poor posture, repetitive tasks, or inadequate equipment (Umana, Umoh and Nsikan, 2019).

The key components of ergonomics include posture optimization, task design, communication and feedback and equipment adaptation (Koirala and Nepal, 2022). All these components contribute to improved employee well-being, increased productivity, reduced absenteeism, and higher job satisfaction (Yattani, Wario, Ombui, and Nyang'au, 2024). However, the benefits of ergonomic' design and implementation in the workplace are limited if workers do not participate in the process.

Participatory ergonomics (PE) goes beyond traditional ergonomics by actively engaging employees in identifying, analyzing, and resolving ergonomic issues. As the primary users of workspaces, employees possess valuable insights into what can improve their comfort, efficiency, and health. The defining features of PE include employee involvement in decision-making, ergonomic problem identification, and continuous feedback and communication (Gumasing, Rendon, and German, 2023; Lora, Pérez and Álvarez, 2023).While participatory ergonomics has shown significant promise in modern workplaces (Kamijantono, Sebayang and Lesmana, 2024; Sakinala, Paul and Fissha, 2024).

Employee competitiveness refers to an individual's ability to perform effectively and efficiently in their job roles, standing out in terms of productivity and innovation (Uforo *et al.*, 2022). Hence, the term employee competitiveness and employee performance can be used interchangeably as they have the same meaning. Although participatory ergonomics has been widely adopted in various industries, including banking and manufacturing and education (Ebito and Umana, 2019; Kottala and Sahu, 2024; Motamedzadeh *et al*., 2021), its potential impact on healthcare environments, particularly in enhancing the competitiveness of healthcare workers, requires further empirical investigation.

As healthcare systems worldwide face increased pressure due to aging populations, increased pandemics tendencies, and limited resources, ensuring a healthy and competitive health workforce is crucial. Thus, this study could offer strategies for healthcare institutions within the study area to reduce negative work behaviour and retain skilled workers, contributing to the long-term sustainability of healthcare services. Therefore, this study examines the synergistic effects of participatory ergonomics and risk management on the competitiveness of healthcare employees, contributing to the understanding of how these factors influence performance in the healthcare sector.

The healthcare sector is highly dependent on its workforce to provide quality care. Repetitive strain injuries, musculoskeletal disorders, and fatigue or burnout, are highly

acknowledged as the human factor ergonomics (HFE) issues commonly found among healthcare workers leading to absenteeism, reduced productivity, and lower quality of patient care. Healthcare workers are exposed to various physical and psychosocial risks, such as long working hours, repetitive tasks, patient handling discomfort, and emotional stress. Yet, they seldom participate in designing the solution algorithm or the actual interventions for the ergonomics risks they are daily exposed to at work. Moreover, their involvement in managing the mechanism of communication and feedback when HFE challenges surface are often not clearly defined, implemented and monitored.

In Nigeria, the situation is further compounded by the near death of relevant empirical data showcasing evidence of healthcare employees' collaboration with their management to design their jobs and/or operational tasks in a bid to mitigate ergonomics risks at work. Similarly, it is not clear whether healthcare workers in Nigeria are properly guided in risk management protocols involving risk identification, analysis, and mitigation of workplace ergonomic risks. Hence, in many scenarios, healthcare workers often seem helpless when exposed to various workplace hazards. These factors make it crucial to assess how participatory ergonomics and workspace risk management can reduce workplace hazards and improve overall well-being and performance.

Unlike many industries, healthcare workers must often balance complex, physically demanding tasks with high emotional and cognitive loads.Studying how the involvement of employees in ergonomic decisions and implementations, and in the management of workspace risk influences competitiveness in this sector would provide insights into how to tailor these interventions to meet the unique needs of healthcare professionals. By integrating participatory ergonomics and risk management, the study can identify solutions to enhance the competitive efficiency of health workers, and ultimately benefiting patient outcomes.

Although studies on healthcare ergonomics abound in existing literature., he aspect of involving healthcare employees in planning, designing and controlling ergonomic decisions involving jobs and tasks design, communication and feedback management, workspace risk identification and mitigation, are rarely researched. The few available studies were conducted in developing economic context, mostly leaving out variables such as workspace risk identification and mitigation, and the role of employee feedback in the ergonomic intervention process; representing a significant knowledge gap. In addition, the synergistic effects of participatory ergonomics and workplace risk management, on workers competitive performance in the Nigerian healthcare sector is uncertain because it is infrequently investigated. Knowledge of existing participatory ergonomic studies focusing on the in Akwa Ibom State's healthcare sector is doubtful. This study fills the gaps by examining how these two strategies (participatory ergonomics and workplace risk management) jointly influence the healthcare workers' competitiveness in Akwa Ibom State, thus, laying a theoretical foundation for broader application.

The overall objective of this study was to examine the nexus between participatory ergonomics, workspace risk management, and employee competitiveness in the secondary healthcare institutions of Akwa Ibom State. In specific terms, the following are the key objectives:

i. Determine the relationship between participatory communication and feedback and secondary healthcare employee competitiveness
ii. Assess the relationship between participatory job design and secondary healthcare employee competitiveness

Based on the objectives the following objectives were formulated

i. Participatory communication and feedback is not significantly related to secondary healthcare employee competitiveness.
ii. Participatory job design has no significant relationship with secondary healthcare employee competitiveness.

2. Literature Review

2.1 The Concept of Workplace Ergonomics

Workplace ergonomics or HFE can be define as the process of exploring how human interacts with other elements of a system, with a view toward improving human well-being and the overall efficiency and effectiveness of the system. It focuses on designing the work environments, work structure, processes, and products to aligns with human capabilities and limitations, taking into account the physical, cognitive, and organizational factors, in order to minimise waste, health risks, and improve safety and comfort (Motamedzadeh *et al*., 2021).

Workplace ergonomics as a concept can contribute to the planning, design and evaluation of tasks, jobs, products, environments and systems in order to make them compatible with people's needs, abilities and limitations (Sakinala *et al*., 2024). Wilson, (2014) highlighted three distinct areas of ergonomics including the physical ergonomics, cognitive ergonomics, and organisational ergonomics.

While cognitive and physical ergonomics is beyond consideration of this research, the focus of this study centres on organisational ergonomics which is concern with the improvement of work systems, organizational structure, policies and processes in order to minimise safety risks, but enhance workers wellbeing, and improve efficiency and employee productivity (Gumasing *et al*., 2023).

Lola *et al*., (2023) notes that the goal of organizational or workplace ergonomics is the attainment of a fully harmonized work system that ensures employee job satisfaction and commitment. It is all about building better working place with jobs designed to match capabilities of people resulting in better working experience (Gumasing *et al*., 2023). Koiraia and Nepal (2022) envisaged that workplace ergonomics tends to address work-related musculoskeletal disorders.

According to Yattani *et al*., (2024) workplace ergonomics has objectives such as promoting the health of workers and their working capacity, improving the environmental conditions, and working cultures development toward workplaces safety and health (Jaiswal, 2022). Ergonomics takes into account employees' physical, mental, social, organizational, and environmental factors when designing the workplace, jobs, environment, and systems to make sure they fit their needs, abilities, and limitations (Akinyinka, Oluwole and Odusanya, 2019).

2.2 Participatory Ergonomics

Participatory ergonomics (PE) has emerged as a key approach in ergonomics and occupational health, drawing increasing attention from researchers and practitioners alike. Defined as the involvement of workers in the identification, analysis, and implementation of ergonomic interventions (Kottala and Sahu, 2024), PE emphasizes the critical role that employees play in designing workplace solutions. Several studies have demonstrated the effectiveness of participatory approaches in reducing workplace risks, improving employee health, and fostering organizational change (Sujan *et al*., 2021). This literature review

synthesizes key research on the elements, benefits, and implementation strategies of participatory ergonomics.One of the primary characteristics of participatory ergonomics is the active involvement of workers in the ergonomic decision-making process. Researchers such as Kottala and Sahu, (2024) highlights that this involvement ranges from problem identification to solution development, with workers offering valuable insights into task-related risks that external analysts may overlook. The key element here is that workers are not passive recipients of ergonomic changes but are agents in the improvement process.

Numerous studies document the benefits of participatory ergonomics in terms of both health outcomes and organizational performance (Motamedzadeh *et al*., 2021). One of the most widely acknowledged advantages is its positive impact on worker health and safety Lola *et al*., (2023). Research by Hignett *et al*., (2007) demonstrates that involving workers in ergonomic interventions leads to a significant reduction in the incidence of musculoskeletal disorders (MSDs), one of the most common workplace injuries. Similarly, Wilson (2014) notes that participatory approaches can reduce the physical and psychological strain placed on employees by improving workstation design and work methods.For participatory ergonomics to succeed, senior management must demonstrate a clear commitment to worker involvement in the ergonomic process, providing the necessary resources and support (Bakker *et al*., 2021). As Boschman *et al.*, (2017) note, without leadership buy-in, efforts to engage workers in ergonomic decision-making are unlikely to succeed. In addition, setting up multidisciplinary ergonomic teams that include both employees and experts is a key strategy.

According to Kottala and Sahu, (2024) such teams serve as the operational units responsible for identifying ergonomic risks and proposing solutions. These teams benefit from a diversity of perspectives, combining the practical knowledge of workers with the technical expertise of ergonomists and safety officers (Gumasing *et al*., 2023). De Jong, Vinkand Block, (2012) notes that a dedicated team, often including workers, managers, ergonomists, and health and safety personnel, is usually formed to guide the intervention process.

2.3 Participatory job design in workplace ergonomics

Participatory job and task design are key concepts in workspace ergonomics, emphasizing worker involvement in shaping their roles and activities to optimize health, safety, and efficiency. In itself, job design is defined as the act of modifying the content of the job and processes of performing a job geared towards boosting motivation, improving performance, and stimulating job satisfaction.

According to Sujan *et al*., (2021) work design in ergonomics, entails proper job identification, careful specification of job contents, and meticulous determination of the requirements for task performance in a manner that enhance effective performance and less or no injuries. As workspace ergonomics continues to evolve, there is increasing recognition of the value of involving employees in the design and adjustment of their tasks. This is where participatory job design becomes crucial. Participatory job and task design is grounded in the principle that workers, as the individuals who are familiar with the nuances of their roles, are best positioned to identify risks and propose solutions for improving ergonomics (Wilson, 2014). It involves workers collaborating with management and ergonomics experts to assess and modify tasks, workflows, and job responsibilities, ensuring that they align with ergonomic best practices (Yattani *et al*., 2024).

Key elements of participatory job and task design include worker-centered task analysis, which involves assessing each task from the worker's perspective. Workers are encouraged to articulate the physical, cognitive, and organizational demands they face and suggest ergonomic adjustments (Drissen, 2010). This analysis often leads to task redesigns that minimize physical strain and repetitive motions while maximizing comfort and efficiency. The concept of continuous task improvement is also central to participatory task design. Rather than making one-time adjustments, organizations adopting this approach recognize the importance of regularly revisiting and updating job designs based on worker feedback. This allows ergonomic interventions to evolve alongside changes in technology, work practices, and worker needs (Bakker *et al*., 2021).

2.4 Participatory communication and feedback

Participatory communication and feedback are key elements in the effective management of workplace ergonomics, enabling workers and management to collaboratively address ergonomic challenges. The integration of participatory communication in ergonomics emphasizes active worker involvement in identifying problems and proposing solutions, while feedback loops help refine and sustain ergonomic improvements (Akinyinka, Oluwole and Odusanya, 2019). Drawing insights from various studies, this section review the literature on how participatory communication and feedback enhances workplace safety, productivity, and overall workers well-being.

Participatory communication in workplace ergonomics refers to the open exchange of ideas and information between workers and management regarding ergonomic issues (Uttong *et al.,* 2024). A key element is two-way communication, where workers are encouraged to voice their concerns about workplace design and conditions, while management listens and responds with appropriate actions (Gumasing *et al.*, 2023). This approach differs from top-down communication, where decisions are made without considering workers' input. Participatory communication fosters collaboration, enabling both parties to contribute to the identification and resolution of ergonomic challenges.

Similarly, ongoing feedback mechanism form another crucial element of participatory communication. Feedback loops allow workers to provide continuous input on the effectiveness of ergonomic interventions. As ergonomic improvements are implemented, regular feedback from employees ensures that these solutions are practical and sustainable over the long term (Lola *et al*., 2023). This iterative process of communication and adjustment helps organizations fine-tune their ergonomic practices based on real-time feedback from employees.

The literature holds that participatory communication and feedback offer numerous benefits for workplace ergonomics intervention (Hignett *et al*., 2007). One of the most prominent advantages is the enhancement of worker comfort and safety. When workers are actively involved in ergonomic decision-making and provide feedback on implemented solutions, the result is more effective interventions that address the specific discomforts and risks they face (Bakker *et al.*, 2021). By directly communicating with employees, organizations can design workplaces that minimize physical strain and injury, ultimately reducing the incidence of work-related musculoskeletal disorders (Wilson, 2014).

Research also indicates that participatory communication can result in enhanced productivity (Dong *et al.,* 2020). Ergonomically optimized work environments reduce physical discomfort, fatigue, and injury, allowing employees to perform their tasks more efficiently (Vink et al., 2006). When workers are less burdened by ergonomic issues, they can

focus on their tasks without unnecessary distractions, leading to improved productivity and fewer lost workdays. Continuous feedback ensures that these ergonomic interventions remain effective, further contributing to sustained productivity gains (Koningsveld et al., 2005).

2.5 Theoretical Framework

Several theories can explain the linkage between participatory ergonomics, workplace risk, and employee performance in the healthcare sector. However, this study rests on the Hackman and Oldham's Job Characteristics Model (JCM). Hackman and Oldham's Job Characteristics (JCM) model of 1974 is till today, a prominent model of job design that can also explain ergonomics system. The JCM identifies five core job dimensions skill variety, task identity, task significance, autonomy, and feedback—that impact three critical psychological states: experienced meaningfulness, responsibility, and knowledge of results. These psychological states, in turn, influence key outcomes such as job satisfaction, motivation, and productivity. This model has been found useful in the explanation of job outcomes. It indicates that work should be designed to possess certain core characteristics which would trigger certain psychological reactions to the job that subsequently impact on job outcomes (Teja and Krishnamurti, 2021).

In participatory ergonomics, employees are actively involved in designing their work environments, including the identification and management of ergonomic risks. This involvement directly increases job autonomy**,** one of the key dimensions of the JCM. Higher autonomy leads to greater ownership over work processes, which is likely to boost intrinsic motivation and productivity (De Jong, Vink, and Blok 2012; Boschman *et al*., 2017). Effective risk management, especially in a high-risk sector like healthcare, enhances the task significance dimension. When healthcare employees understand how ergonomic improvements reduce risks and improve safety, they perceive their jobs as more meaningful, which aligns with the "experienced meaningfulness" psychological state in the JCM. This can positively affect their engagement and competitiveness.Participatory ergonomics encourages employees to contribute to different aspects of their work environment, such as identifying risk factors or designing task workflows (Gumasing, Rendon and German, 2023). This can increase the skill variety of their roles, which is another core dimension of the JCM. The more variety and challenge in a job, the greater the potential for increased job satisfaction and productivity.

The JCM emphasizes in this study is also the importance of communication and feedback in job design. Participatory ergonomics often includes ongoing communication and real-time feedback mechanisms, where employees assess and refine ergonomic interventions. This continual loop of feedback helps employees stay informed about how their contributions are improving workspace safety and productivity, reinforcing the psychological state of "knowledge of results" (Kottala and Sahu 2024 p.123).

2.6 Empirical Literature Review

Augustina *et al.,* (2024) examined the Influence of Workstations and ergonomic work postures on employee job satisfaction in the academic library in Indonesia.This study focuses on workstations, work postures, and employee job satisfaction in the Brawijaya University Library. This study aims to determine the influence of workstations and ergonomics work posture on employee job satisfaction in the library. The research method used a quantitative approach. The sampling technique is total sampling with a total of 45 library staff from 5 departments in the library. This study uses multiple linear regression

analysis techniques. The study results are the influence of workstations and ergonomic work posture on employee job satisfaction, with the t-test values for both variables being 2.899 > 2.018 and 3.050 > 2.018, respectively. Based on the results of the R2 test that has been carried out above, the results of the R test of this study are the Workstation variables (X1), Work Posture (X2), simultaneously having an effect of 0.674 or 67.4% on the Job Satisfaction variable (Y). This means that the independent variable provides 67.4% of the information needed to predict and explain the variation of the dependent variable. At the same time, 32.6% is influenced by other factors or variables that are not examined. This study is related to the present study as they both evaluated workstations and ergonomics but different in terms of research design. Previous used quantitative approach while the present used qualitative approach such as survey design

Kgakge *et al.,* (2024) investigated ergonomics and occupational health: knowledge, attitudes andpractices of Nurses in a Tertiary Hospital in Botswana Musculoskeletal disorders (MSD) are, to this day, considered one of the major occupational health risks, especially among healthcare workers. Poor working conditions, such as awkward postures, are associated with the development of MSD. The study aimed to evaluate the knowledge, attitudes, and practices (KAP) of nurses at a public tertiary hospital in Botswana relating to ergonomic principles. The researchers conducted a cross-sectional survey, using a self-administered questionnaire to collect the data. The researchers employed Stata v18 (StataCorp, USA) to perform descriptive and inferential statistics. The chi-square test was used to determine the association between knowledge levels and socio-demographic variables. *p*-values ≤ 0.05 were deemed statistically significant. In total, 306 nurses participated in the study, and a response rate of 88.4% was achieved. The mean age was 35.5 (SD ± 8.79) years. Most (69%) participants were female nurses. About 99.3% (95% CI: 97.7–99.9) of the participants were familiar with the concept of ergonomics. Only a small proportion of participants (26%) possessed high levels of knowledge, exhibited positive attitudes, and demonstrated good practices in relation to ergonomic principles, following the composite analysis. A statistically significant relationship was found to exist between sex and practice ($p = 0.030$) and between length of work and practice ($p = 0.013$). The KAP analysis indicated that most nurses had poor practices regarding essential ergonomic principles. These findings could inform policy development and enable employers to design prevention strategies, especially those aimed at preventing lower back pain (LBP). This study is related to the present study in terms of the variable used as they both sought to examine ergonomics but different in terms of method of data analysis used. Present study used regression analysis but previous study used KAP analysis.

Mensah and Owusu (2022) examined the impact of participatory communication on employee competitiveness in sub-Saharan African healthcare systems; the expo factor design was adopted. Population comprises of senior staff for the selected health care center the result showed that participatory design had limited effects due to resource scarcity and rigid management practices, indicating the need for supportive infrastructure to realize the full potential of such interventions. In conclusion, participatory job and task design holds significant potential for enhancing workers' competitiveness in the healthcare industry by improving efficiency, fostering innovation, strengthening team collaboration, and mitigating burnout. However, its effectiveness depends on factors such as organisational support, resource availability, and contextual appropriateness. To maximize its benefits, healthcare organisations should integrate participatory practices with training programs, strategic alignment, and systemic reforms. Future research should adopt longitudinal and mixed-method approaches to address the existing gaps and provide a deeper understanding of the mechanisms underlying the relationship between participatory job design and workers'

competitiveness. This study is related to the present study in terms of organisation of the study as they evaluated health sector but different in terms of the research design adopted. Present study used survey design but previous study used ex-post facto research design

Kamijantono *et al.,* (2024) researched on the link between participatory ergonomics and employee competitiveness in healthcare sector in Mali. The primary data was generated from a population of 2902 and the result found that the involvement of healthcare workers in ergonomic interventions led to improved task completion rates, reduced errors, and greater overall job performance. The study highlighted that employees who had been involved in ergonomic assessments felt more capable of managing their workload, contributing to their professional growth and competitiveness within the healthcare sector. This study is related with the current study as they both examined participatory ergonomics but different from the study area. Previous study was conducted in Mali but present study was carried out in Nigeria.

3. Methodology

3.1 Research Design, Population and Sampling

This study adopted the survey research design. This method was employed because of the need to promptly harvest the opinions of a large population of healthcare workers about specific issues bordering on participatory ergonomics, workplace risks, and employee competitiveness. According to Rahman, (2023) survey design is appropriate for achieving such aim, given its swiftness, wider reach and cost efficiency.

The study population included all secondary level healthcare institutions in Akwa Ibom State. However, due to the need to enhance quality and uniformity in data collection, the study resorted to selecting only government-owned secondary level hospitals commonly addressed as “General Hospitals”. There are 31 general hospitals in the state. The unit of analysis were all categories of workers in these general hospitals.

The Akwa Ibom State Hospital Management Board provided a comprehensive list showing about 2,760 general hospital workers as at the time of this study. Given the large population, and the limited resources for the research, conducting a sampling study became a inevitability. A sample size of 456 respondents was determined using the Krejcie and Morgan’s (1970) sample size calculation table. The convenience sampling method was employed due to its practicality, allowing for the recruitment of participants who were both willing and available during the study period (Hossan, Dato’Mansor and Jaharuddin, 2023). This approach was chosen to ensure efficient data collection within the constraints of time and resources.

3.2 Data Collection Instrument, Measurement, and Validation

The study is quantitative in nature and sourced primary data through the close ended structured questionnaire. Using the questionnaire for this study was considered appropriate because of its advantages such as standardization, coverage, economy, and the need to collect cross sectional data at one point in time.

The questionnaire was structured using a 5-point Likert scale, where 'strongly agree' was assigned 5 points and 'strongly disagree' was assigned 1 point. A total of 20 questions were developed, aligned with the study's variables and overall objectives. Some items were adapted, with slight modifications for relevance, from previous studies by Ebito *et al*. (2019), Hignett *et al*. (2007), and Umana *et al*. (2019). Following the recommendation by Hair,

Anderson, Tatham, and Black (2010), these prior studies were used to enhance the questionnaire's validity. Copies of the questionnaires were personally administered to willing and available healthcare workers at their workstations. To facilitate data collectionfrom all locations of the healthcare institutions under study, two field assistants were engaged and trained on modalities of data collection.

The variables of this study include; participatory workplace ergonomicsandemployee competitiveness.Participatory ergonomics, the independent variable was further decomposed into two measures, namely participatory communication and feedback (PC&F), and participatory job design(PJD). On the other hand workers competitiveness; a measure of performance of secondary health workers relative to set targets and standards, constituted the dependent variable. Worker's competitiveness (WC) was evaluatedusing two proxies namely: the rate of task achievement (job output per time), and job performance efficiency (error-free outputs).

The questionnaire items were validated by two specialists in the healthcare industry and two academics that are well versed in ergonomics discipline. Their inputs helped in making slight modifications to the initial version of the questionnaire, aiding the quality of field survey data collected. In addition, the Cronbach Alpha approach was used to determine the reliability of the questionnaire items. As shown in Table 1, all the variables retunedCronbach alpha values above the recommended coefficient of 0.70 according to Hair *et al*., (2017).

3.3 Techniques of Data Analysis

The descriptive statistics were adopted to summarise the respondents' demographic characteristics. The structural equation modelling technique (SEM) was used to evaluate the relationship between all the variables (participatory ergonomicsand workers competitiveness). The partial least square (PLS) version of SEM software was adopted because of its robust statistical analysis and results when testing hypotheses (Mahadzirah, *et al*. 2019). In addition, the PLS-SEM is a versatile tool that can evaluate complex multivariate relationship at once and produced reliable results in one iteration (Beran and Violato, 2010).

4. Results and Discussion

4.1 Descriptive Results

Out of 456 respondents who received the administered copies of the structured questionnaire, 316 copies were found to be usable for analysis. This yielded a response rate of 69.3 percent, which was considered substantial for the study given the difficulties in collecting data in most developing countries including Nigeria. The descriptive result shows that majority (78%) of valid respondents were female. Among the total respondents, 25% were medical doctors, 34% Nurses, 22% pharmacists, and 19% were support service staff. They were drawn from various units/departments such as medical emergency (12%), Paediatrics (13%), General Surgery (11%), Radiology (12%), General Outpatient (18%), Obstetrics and Gynecology (10%), Intensive care (7.0%), and administration (17%).

4.2 Measurement Model Results

Table 1and Figure 1 shows the results for measurement model showing the parameters used to estimatethe validity and reliability the data (Gannon *et al.*, 2017). It includes Confirmatory Factor Analysis(CFA), Cronbach's Alpha (α), Composite Reliability (CR) and Average Variance Extracted (AVE). Starting with the CFA, result shows that apart from two indicators that failed below the minimum point and were removed from further analysis, all other CFA results shows that the latent variables (PJD, PC&F, and WC) loaded above the benchmark score of 0.70. Thus, the higher the factor loading score, the greater the contribution of their indicators to the entire research model. Furthermore, results (Figure 1, and Table 1) indicates that values for Cronbach's Alpha, CR and AVE for each variable are well above the recommended cut-off values: 0.75, 0.7 and 0.50 respectively; thus, satisfying conditions for construct reliability and internal consistency (Hair *et al.*, 2017a). Hence, the model yielded robust results that is appropriate for further analysis.

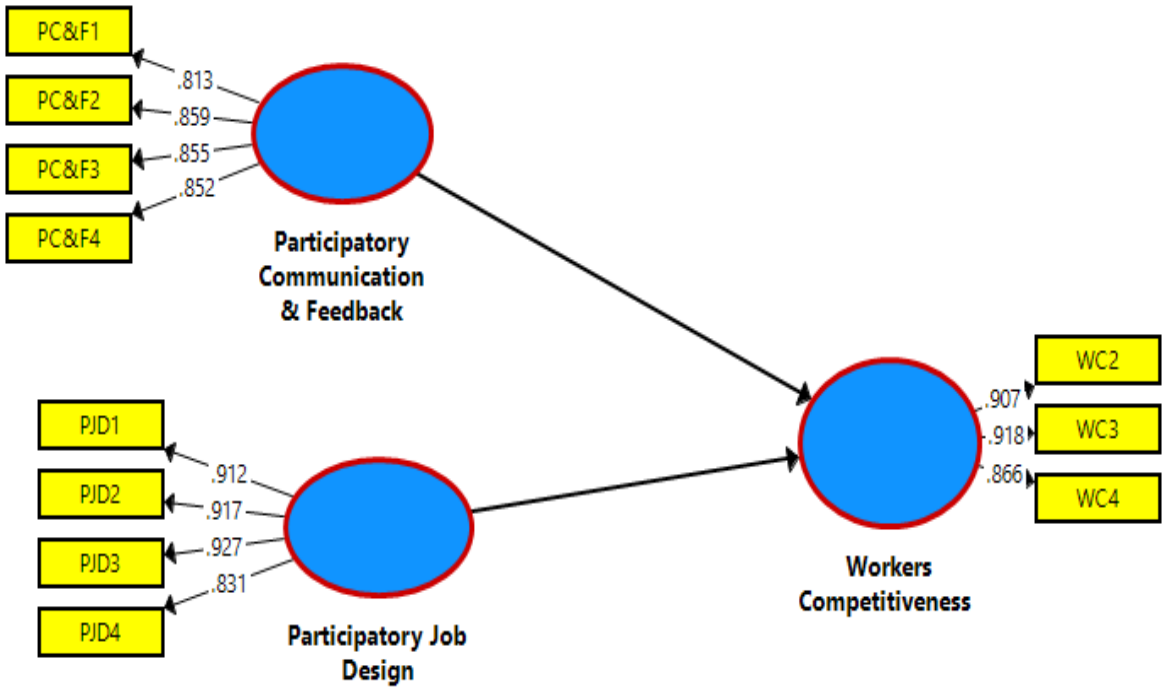


Figure 1: Measurement Model Chart

Table 1: Measurement Model Results

Latent Variable	**Construct**	**CFA** (Loadings)	**CR**	**Cronbach Alpha**	**AVE**
Participatory Job Design (**PJD**)	I am regularly involved in designing my work tasks.	0.912	0.936	0.909	0.786
	My input is valued when deciding how tasks should be performed.	0.917			
	There is strong collaboration between employees and management in designing job roles.	0.927			
	My tasks are designed with my comfort and safety in mind	0.831			
Participatory Communication and Feedback (**PC&F)**	There is open communication about safety and health concerns	0.813	0.878	0.796	0.707
	I receive regular feedback on my task performance.	0.859			
	My suggestions for improving task performance are taken seriously.	0.855			
	I have opportunities to provide feedback on my working conditions.	0.852			
Workers Competitiveness (**WC**)	My focus and accuracy during patient care have improved.	0.907	0.925	0.879	0.805
	I have noticed increased job satisfaction and efficiency.	0.918			
	My health has improved, and the risk of work-related injuries is lower.	0.866			
	I feel more confident performing tasks without strain.	-			

4.3 Structural Model Results- Test of Hypothesis

Table 2 and Figure 2 demonstrate the results of hypothesis testing; showing the path coefficients (β), t-values, and p-values. According to Hair *et al*., (2012) only predictor variables with β values above 0.1 can be accepted as influencing the response variable. In addition, a t-value greater than 1.645, and p- value less than 0.05 are required for a positive significant relationship between the independent and dependent variables (Hair *et al.,* 2017).

Accordingly, it can be observed that there is a positive, weak, but significant relationship between participatory communication and feedback and healthcare workers competitiveness: PC&F (β: 0.098, t-value: 2.206, p-value: 0.014). In addition, results indicate that a strong, positive, and significant relationship exist between participatory job design (PJD) and employee competitiveness: PJB (β: 0.799 and t-value: 20.831, p-value: 0.000). Hence, null hypotheses $H0_1$&$H0_2$ are rejected as shown in Table 2.

Table 2: Hypothesis Testing Results

	Path Co-efficient (β)	Mean (M)	Standard Deviation (ST.DEV)	T Statistics (β /ST.DEV)	P Values	Decision
$H0_1$: PC& F-> WC	0.098	0.097	0.044	2.206	0.014	Significant ($H0_1$: Rejected)
$H0_2$: PJD -> WC	0.799	0.8	0.038	20.831	0.000	Significant ($H0_2$: Rejected)
	R Square(R^2): 0.746			R Square (R^2) Adjusted 0.743		

NB: *PC&F= Participatory communication and feedback, PJD= Participatory job design, WC= Workers competitiveness.*

Similarly, the results indicates that PJD yielded a higher statistical beta coefficient value (β = 0.799) compared to PC&F (β = 0.098), implying that PJD has greater predictive power (approximately 0.80%) of its influence on workers competitiveness than PC&F. Moreover, the adjusted R^2 of 0.743 implies that the components of the independent variable (PJD and PC& F) can predict about 74.3% change in the dependent variable (employee competitiveness) all things being equal.

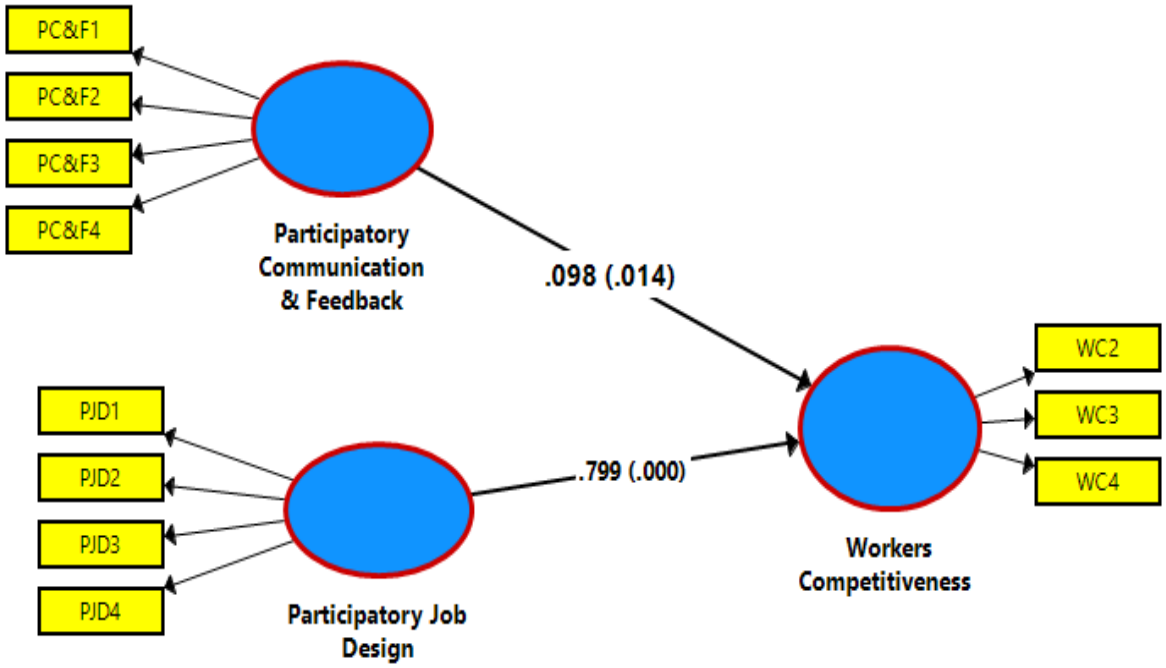


Figure 3: Estimated Structural Results

4.4 Discussion and Managerial Implications

Generally, the study has found significant positive relationship involving participatory healthcare ergonomics components (PJD and PC&F) and workers competiveness. This have several important implications for healthcare ergonomics. To start with, the results has provided insights into how these factors shape the competitiveness of healthcare workers, revealing the relative strength of each predictor.Moreover,the findings reinforce the role of participatory ergonomics in boosting employee competitiveness in the healthcare sector. Thus, ergonomics interventions that address issues like strain, fatigue, safety, and discomfort would help the healthcare workers to focus more on patient care, thereby improving their performance and enhancing their competitiveness as maintained by previous studies like Gumasing *et al*., (2023), and Perry *et al*., (2021). In addition, the strong, positive and significant influence of PJD on WC suggests that job designs that involve worker input and prioritize their comfort and safety significantly enhance their competitiveness. This is consistent with previous studies like Shoubi, Barough and Rasoulijavaheri, (2013) that emphasises improved job design practices for enhanced ergonomic outcomes

On the other hand, while still important, the study shows that open communication about safety and regular feedback are less influential compared to participatory job design.In essence the variation in workers' competitiveness can be explained by these two factors, implying that PJD and PC&F together have substantial predictive power. In particular, the findings related to PJD suggest that when workers have a say in task design, they experience higher levels of job satisfaction, focus, and overall effectiveness, as these correspond directly to the improved competitiveness highlighted in the results. Moreover, it suggests that workers who feel that their physical well-being is prioritized are likely to perform better, reducing strain and the risk of injuries, leading to better competitive outcomes in healthcare settings.

The findings have several implications for theory and practice of healthcare ergonomics, particularly regarding how healthcare institutions should prioritize employee engagement in work design and communication. First, job design should be seen as a key driver of workers competitiveness. This can lead to improvements in job satisfaction, task focus, less medical errors, and overall patient care effectiveness. The implication here is that healthcare organizations should consider revising their job design practices to be more inclusive and worker-centered. Second, while important, feedback and open communication contribute less to workers competitiveness compared to job design, this should not be neglected, as clear communication about health concerns and regular performance feedback still contribute to creating a safer, more engaged, and motivated workforce. They both play complementary roles in the broader participatory healthcare ergonomics management.

For healthcare managers, prioritizing inclusive task design and decision-making processes can improve morale and performance, as employees will feel valued and considered in how their work is structured. For policy makers, there is a need for policy frameworks that mandate participatory ergonomics in healthcare institutions. As revealed by the study, simply fostering communication and feedback mechanisms may not be sufficient to improve competitiveness. Policies should shift from basic communication to actionable feedback that directly links ergonomic improvements in hospitals to measurable outcomes like efficiency, productivity, and error reduction. Management may therefore need to integrate performance-based feedback mechanisms that connect ergonomic interventions with specific performance improvements. For example, instead of generic communication feedback on safety practices, workers should receive targeted guidance on how ergonomic adjustments impact their specific job tasks. Therefore, implementing policies that enforce worker participation in job design, robust communication and enhanced feedback, and safety concerns will likely improve the overall competitiveness of healthcare workers, leading to better patient outcomes and more efficient operations.

5. Conclusion and Recommendations

The main thrust of this study was to argue that involving healthcare employees in solving ergonomic issues in their workplace is a sensible strategy. The study also went further to advocate that creating a synergy between participatory communication in healthcare ergonomics and participatory job design would result in significant competitive performance for healthcare service delivery workers. After careful analysis of the results obtained, two sets of conclusions can be drawn.Healthcare organizations that want to improve worker performance should consider prioritizing participatory job design initiatives such as collaborative task allocation, design of workstations, flexible work plan and schedule, and team- based care planning etc. Given these conclusions, it is suggested that policies should encourage the integration of participatory job design with measurable performance indicators. Employees should be involved in designing tasks with a clear understanding of how those tasks impact operational efficiency, patient care quality, and personal productivity. It is also possible to build a continuous feedback loop between employees and management to ensure that job design is regularly updated to meet evolving needs. This means adapting tasks is not only for ergonomic comfort but also for improving speed, accuracy, and competitiveness in the workplace. To make ergonomic participation more meaningful, management could introduce recognition and reward systems for employees who actively engage in participatory job design or provide feedback that leads to performance improvements. Such incentives could boost both participation and competitiveness.Even though the impact of communication is less than that of job design, organizations should still invest in regular,

meaningful feedback systems to keep workers engaged and informed about their performance. This can be achieved through regular one-on-one meetings between employees and their managers (e.g., monthly or quarterly), implementing 360-Degree feedback systems, and practicing real-time peer feedback.

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